Feb. 8, 1944. N. S. BALLARD, SR 2,341,201

CONTOUR CUTTING MACHINE

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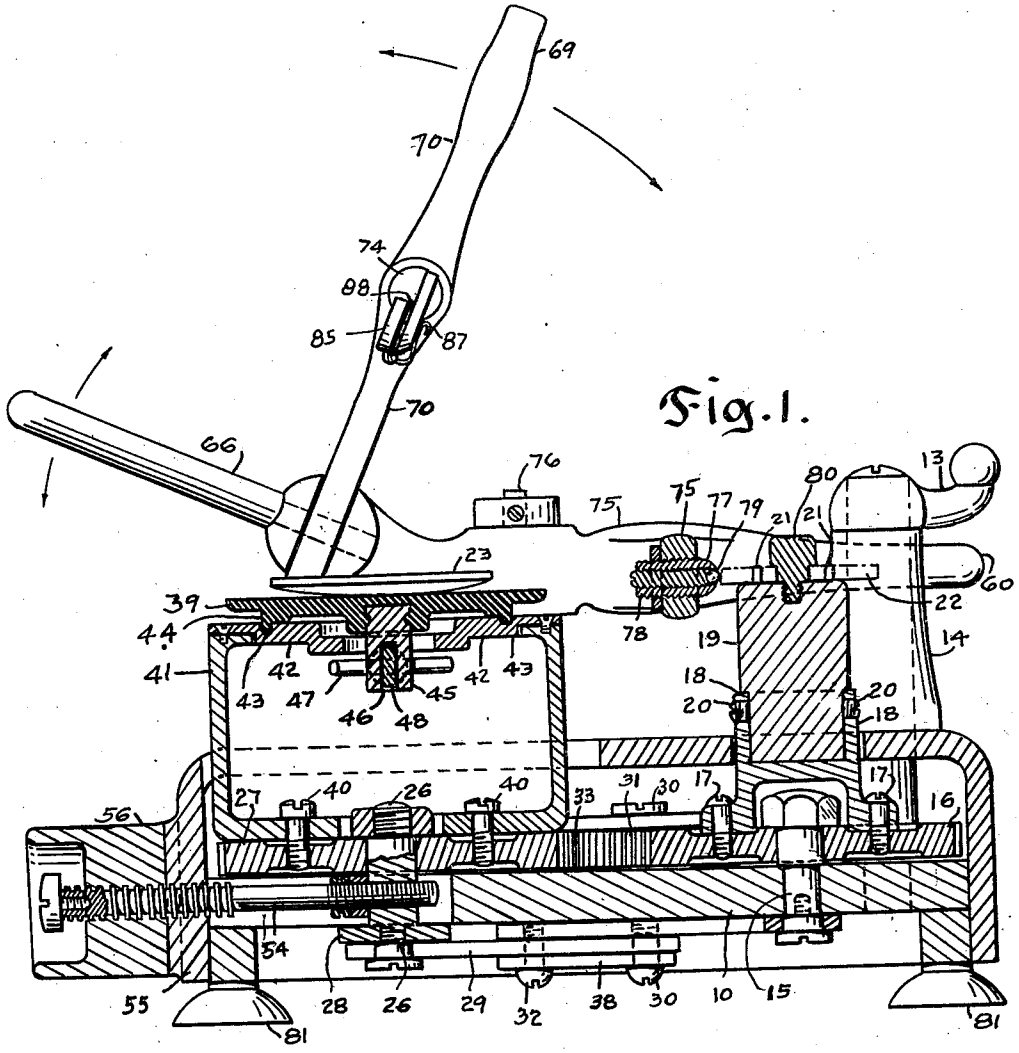


Fig. 1.

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Fig. 5.

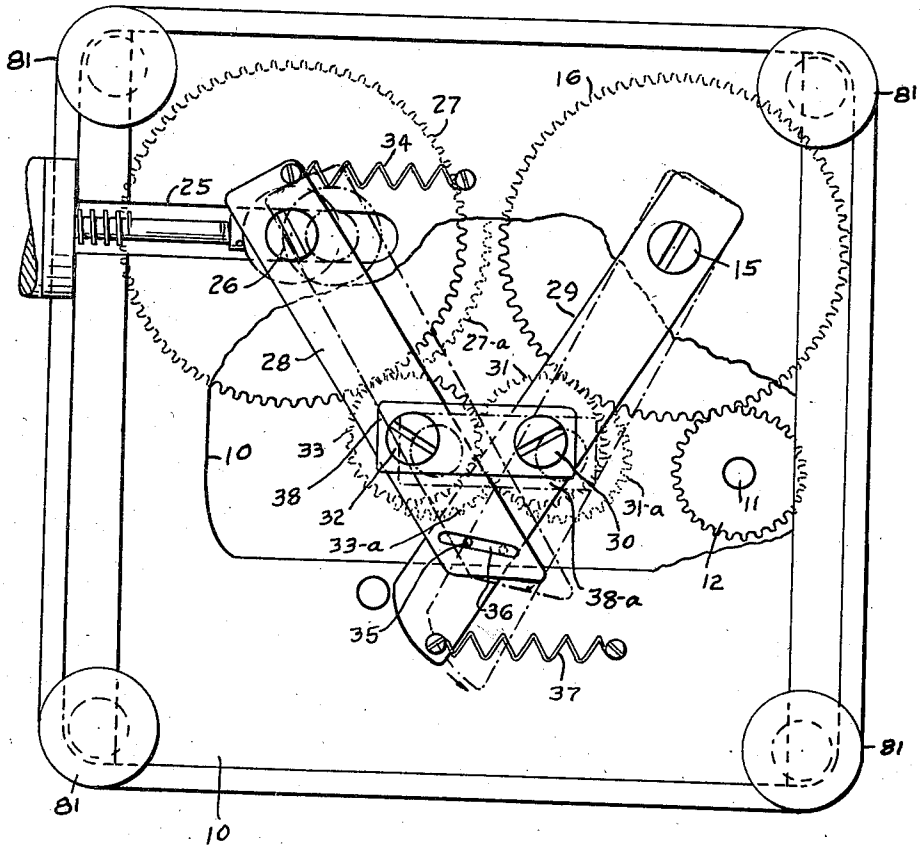
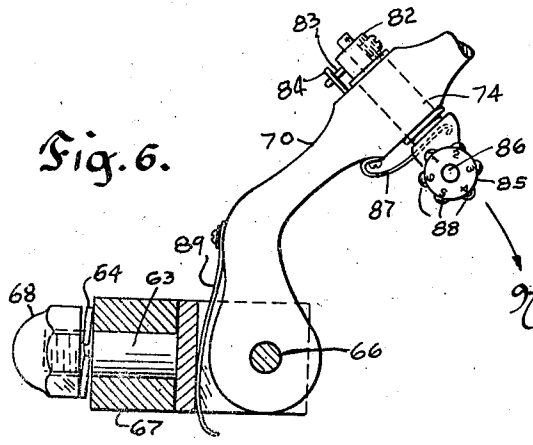


Fig. 6.



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Fig. 4.

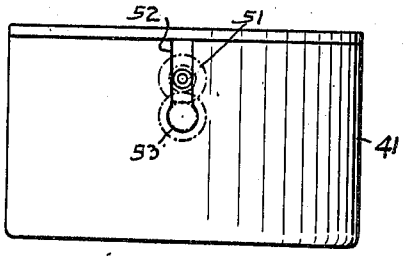


Fig. 3.

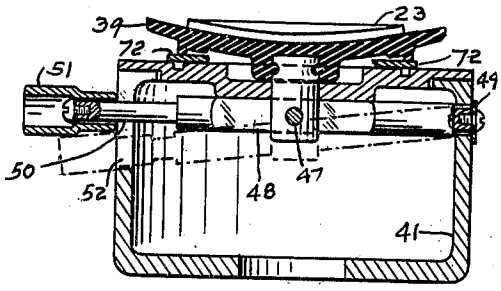
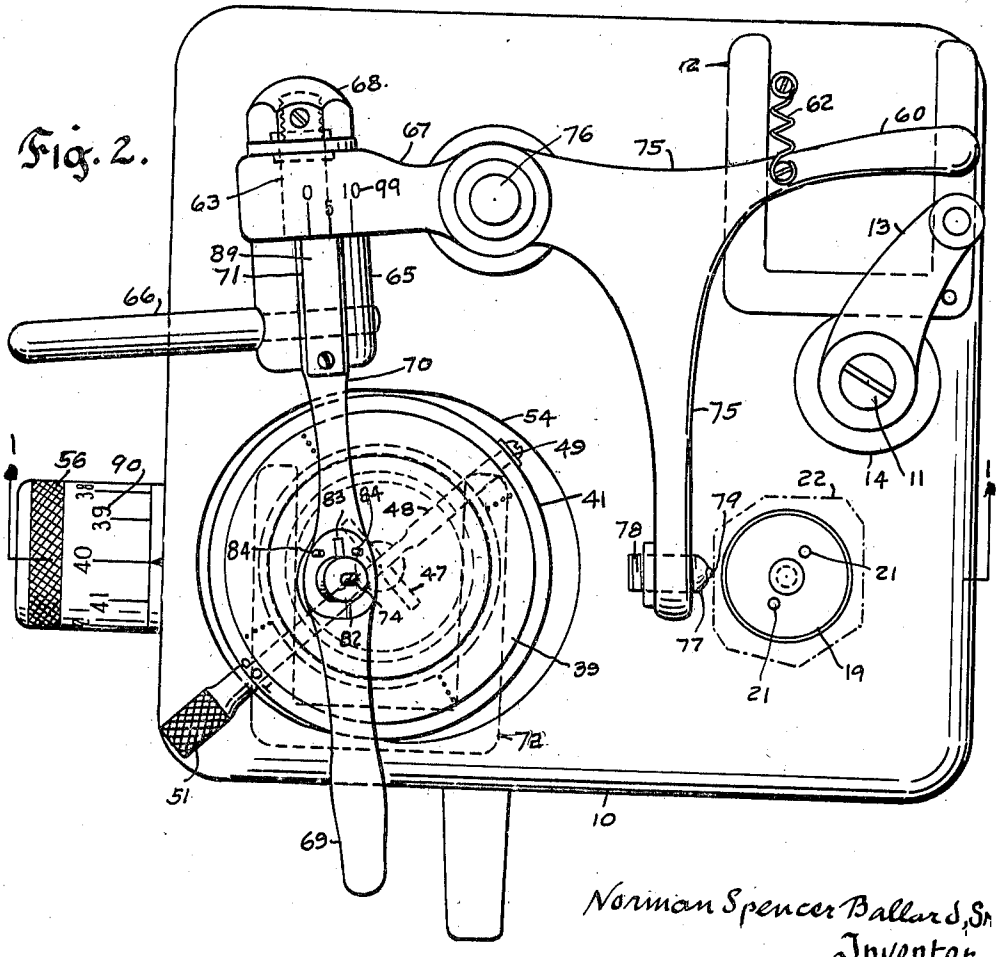


Fig. 2.



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Patented Feb. 8, 1944 2,341,201

UNITED STATES PATENT OFFICE

2,341,201

CONTOUR CUTTING MACHINE

Norman Spencer Ballard, Sr., Los Angeles, Calif.

Application October 24, 1941, Serial No. 416,385

5 Claims. (Cl. 33—28)

My invention relates to that class of machines which are used for cutting the peripheral contours of glass lenses or other glass articles having a symmetrical or unsymmetrical shape. The machines heretofore devised for this purpose have been very complicated and consequently very expensive to construct. It is my purpose to so design a machine of this character that it can be manufactured at much less expense and yet be capable of attaining all of the essential movements and results, eliminating only those features which have a limited need or value.

A further purpose of my invention is to devise a machine in which the work or lens is secured by suction means to a rotating drum and is acted upon by a cutting member which is actuated by a cam or pattern, and provided with means for varying the size of the contour traced by the cutter, at the same time maintaining parallelism between these lines or curves and those of the pattern. A further purpose is to provide means for making angular adjustments of the pattern in co-relation with the lens holder. Another purpose is to provide means for manually adjusting the cutter and the cutter arm in the proper position normal to the surface of the work, together with means for limiting the angular movement of the cutter in its eccentric relation to the swivel and the cutter arm.

An important feature is the lens or work holder consisting of a resilient rotating diaphragm on which the work rests and is secured by a suction produced by depressing the central portion of the diaphragm together with means for locking the said diaphragm in its depressed position.

I illustrate my invention by the accompanying drawings in which Figure 1 is a sectional view taken on the line 1—1 of Figure 2. Figure 2 is a plan view of the machine. Figure 3 is a vertical central section through the lens holding drum, also showing in dot-dash lines the locking lever in its locked position. Figure 4 is a side elevation of the lens holding drum and showing particularly how the locking lever operates. Figure 5 is an inverted plan view showing the driving mechanism and the compensating levers and pinions. Figure 6 is a detailed view, partly in section, showing the cutter arm, the cutter swivel and the cutters themselves, all of which are in the open position. This view also illustrates the spring by which the cutter arm will assume one of two positions—either open with the cutters lifted above the work or closed when the cutters are engaging the work. Similar numerals refer to similar parts in the several views.

The construction of my device is as follows: 10 is a frame-plate on which are mounted the various mechanisms as hereinafter described. Journaled in the frame-plate 10 is a stud 11 having secured to its lower end the primary driving gear 12. Secured to the upper end of the stud 11 is a crank handle 13 by means of which the entire mechanism is operated. The upper end of the stud 11 is spaced to a convenient height above the frame-plate 10 by means of a spacer sleeve 14. Also revolvably mounted on the stud 15, which is in turn secured to the frame-plate 10, is a gear 16, this gear being in mesh with the gear 12. Secured to the upper surface of the gear 16 by the screws 17 is a socket 18 adapted to receive a pattern-holder plug 19, this socket being held in position by the screws 20. By loosening the screws 20 the plug 19 and the pattern 22 can be adjusted into correct alignment. On the upper surface of the pattern-holder 19 are means for locating and holding the pattern 22 in position.

Various means for holding the pattern 22 may be used. In the form shown in Figures 1 and 2 two pins 21 are located in the top of the holder 19 and are adapted to engage corresponding holes in the pattern 22. The periphery of the pattern 22 is preferably of hard metal, cut to the shape of the lenses 23 to be cut. Through the frame-plate 10 is a slot 25 in which is slidably mounted a stud 26, and revolvably mounted on this stud 26 is a gear 27 and a bar 28. On the stud 15 is pivotally mounted the bar 29. Also located on the bar 29 is a stud 30 on which is revolvably mounted the pinion 31; the distance between the stud 15 and the stud 30 is such that the pinion 31 is always in mesh with the gear 16. Likewise, the distance between the stud 26 and the stud 32 is such that the pinion 33 and the gear 27 are always in mesh. The stud 26 as it moves in the slot 25 is actuated by the spring 34 toward the gear 16, the pinion 33 remaining in mesh with the gear 27. In order to keep the two pinions 31 and 33 in mesh the studs 32 and 30 are linked together by the bar 38, the same being mounted on the said studs 32 and 30. The stud 26, as it moves in the slot 25, is actuated by the spring 34 toward the gear 16, the pinion 33 remaining in mesh with the gear 27. In order to synchronize the rotation of the gears 27 and 16 the bar 38 should have its center line parallel with a center line through the studs 26 and 15. This is accomplished by a pin 35 mounted on the bar 29, adapted to engage a slot 36 in the bar 28, the shape of the slot 36 being determined by the movement of the bars

28 and 29. The spring 37 between the frame-plate 10 and the bar 29 provides a tension on the pinions 31 and 33. This condition remains constant regardless of the movement of the stud 26. This mechanism permits of varying the size of the lens contour and at the same time maintaining the contour in complete parallelism with that of the pattern. It also serves to keep the angular advance of the gears 16 and 27 equal although rotating in opposite directions. Secured to the gear 27 by means of the screws 40 is a lens-holding drum 41 provided with a cover plate 42. In the upper side of the cover plate 42 is an annular groove or depression 43. The suction type lens holder 39 is preferably made of rubber and consists of a disc having a downwardly projecting annular rib 44 which is adapted to rest in the cover plate groove 43. This annular rib 44 serves as a guide when the suction is applied. Centrally located and molded in the under side of the disc 39 is a slotted depression member 45. Inserted in the slot 46 and pivotally mounted on the pin 47 is a lever 48 having its inner end hingedly mounted in the wall of the drum 41 as at 49, and having its outer end 50 projecting through a slot 52 in the opposite wall of the drum 41 and ending in a locking sleeve 51. At its lower end the slot 52 has an enlarged opening 53 so that when the lever 48 is depressed the sleeve 51 may be inserted through the opening 53. This action draws down the center of the lens holder 39, producing a suction adapted to hold the lens 23 securely in position during the cutting operation, as shown in Figure 3. The insertion of the sleeve 51 into the opening 53 locks the lens holder in its suction position. Means are provided for varying the distance between the center of the pattern holder 19 and the center of the lens-holder 39 whereby adjustment can be made for the purpose of changing the size of the lens 23 and at the same time maintaining perfect parallelism between the periphery of the pattern 22 and the periphery of the lens 23. This is accomplished by a shaft 54 threaded through the lower portion of the stud 26, passing through the slot 25, also threaded through the frame side-wall 55, and secured to the adjustment knob 56. By turning the knob 56 the lens holding drum 41 is moved laterally, and the degree of movement is indicated by the calibrations engraved on the knob.

The tracer arm 75 is mounted on a supporting shaft 76 and is fitted with an adjustable pattern tracer 77 comprising a screw 78, a ball bearing 79 provided for the purpose of minimizing the wear of the pattern tracer 77 as it contacts the pattern 22. The tracer arm 75 is provided with an extension 60 located adjacent to and underneath the crank 13. The extension 60 is for the purpose of swinging the ball bearing 79 away from the pattern 22 when changes in said pattern have to be made. The tracer arm 75 is held normally against the pattern 22 by means of the spring 62. The portion 67 of the tracer arm 75 extending beyond the shaft 76 has revolvably mounted therein a shaft 63 provided with a spring 64 and nut 68, the other end 65 of the said shaft 63 being provided with a handle 66 adapted to rotate said shaft end 65 and to also serve as a hinge pin for the cutting arm 70. One end of the cutting arm 70 is hingedly mounted on the shaft 63 within a slot 71.

Located at a point on the cutting arm 70 which is adapted to be brought over the lens 23 is revolvably mounted a shaft 74 held in place by the set screw and collar 82. Projecting from the collar 82 is a pin 83 which is limited to a partial revolution by the two stop-pins 84. This prevents the cutter from becoming reversed. At the lower end of the shaft 74 is a cutter holder 85 which is revolvably mounted on the shaft 86. The center line of the cutter holder 85 has its axis offset from the axis of the shaft 74. This offset is for the purpose of obtaining a castor-type trailing movement. A light spring 87 is provided to keep the cutter in proper alignment. Another snap spring 89 is adapted to hold the cutter arm 70 normally in its upright position as shown in Figure 1. The purpose of holding the cutter arm 70 normally in its upward position is to facilitate the placing and removal of the lens 23. Lenses with separate or extreme contours are compensated by the application of shims 72 which are U-shaped in form and which when inserted under the lens holder 39, as shown in Figure 3, tend to adapt the holder to the separate curves of the lenses 23. The purpose of having the cutter arm 70 rotatably mounted on the shaft 63 is to provide a means whereby the cutters 88 can be set perpendicularly to the glass to be cut. If desired, the shaft extension 65 may be provided with gauge marks 99 to show the number of degrees of rotation plus or minus a vertical position of the cutters 88.

The operation of my device is as follows: A pattern 22, preferably of metal, having its periphery cut to the form desired is placed over a pattern holder 19, being located thereon by two dowel pins 21 or other suitable means of location and attachment. The screws 20 are loosened and the plug 19 and pattern 22 are set in such a manner that the pattern axis is in line with the axis of the lens holder 39. This being done, the screws 20 are tightened. The usual method of alignment is to set the pattern holder 19 and the lens holder 39 in the same relative position with the starting point preferably on top of the arc of the pattern 22 and the lens 23. The pattern 22 and the lens 23 must both be on axis at all times, that is; each must be in a corresponding position to the other during the cutting operation. The glass lens 23 is then placed on the rubber lens holder 39 and held there manually a few seconds or long enough to pull down the lever 48 and push the locking sleeve 51 into the opening 53 provided. This forms the lens holder 39 into the shape of a suction cup and holds the lens 23 securely in position. Center lines are shown on the rubber lens holder 39 perpendicular to each other, with a few dots 90 on said lines. This enables the operator to set the lens 23 in position above or below the center or off center to the right or left. During this operation of placing the lens 23 in position for cutting, the cutting arm 70 is lifted and thrown into its upper or clearance position by the spring 89, leaving the lens 23 and holder 39 where a clear vision can be had. Having secured the lens 23 in position, the cutting arm 70 is lowered into position and the adjustment knob 56 turned to suit the cutting of a duplicate contour or one that is larger or smaller. The cutter arm 70 can be rotated on the shaft 63 until the cutter 88 will be perpendicular to the glass 23 when said cutter 88 is in the cutting position. Manual pressure is then applied to the cutter arm 70 and the crank 13 is rotated until the cutter 88 has cut the outline of the lens 23. The cutting arm 70 is then released

and the lever arm 48 and the sleeve 51 are released, permitting the lens to be removed.

What I claim as my invention and desire to secure by Letters Patent is:

1. In a machine of the class described, a work-carrying drum rotatable about a vertical axis, a resilient diaphragm secured to the upper surface of said drum, means for manually flexing said diaphragm downwardly under said work and adapted to hold said work by suction, said means including a lever having one end pivoted in said drum and its opposite end projecting therethrough and having its medial portion under and connected to said resilient diaphragm, together with means for locking said lever and said diaphragm in the depressed position.

2. In a machine of the class described; having rotatably mounted therein a drum provided with a resilient work-holding diaphragm, a pattern, means for rotating said work-holding diaphragm and said pattern in co-relation with each other, a pivotally mounted tracer arm having one extremity in peripheral contact with said pattern and having its other extremity provided with a cutting mechanism, and a cutter capable of engaging and cutting the work held on and rotated with said diaphragm; means for varying the cutting size of the said work as compared with said pattern, said means including a mechanism for horizontally adjusting the position of the said drum relative to the said pattern on a center line passing through the centers of both; and the further means of pattern driving and drum driving gears journaled on studs, compensating levers pivotally mounted on said studs, a link connecting said levers and having rotatably mounted thereon pinions forming a gear train engaging each other and each of said gears, means for holding said pattern gear and said work-driving gear rotatively synchronized with each other, said means consisting of a cam-slot in one of said levers and a pin in the other of said levers, said pin extending through said slot.

3. In a machine of the class described, the combination of a base, a pattern, a rotatable and horizontally movable work carrying drum, a resilient work-holding member on said drum and adapted to hold said work by a partial vacuum created under said work by manually pressing said work on said resilient member; a pantograph arm pivotally mounted on said base, one end of said pantograph arm adapted to bear on said pattern and having on its opposite end a cutter arm holder, and a cutter arm hingedly and retractably mounted thereon; a swivel mounted cutter adapted to engage and cut the work by pressure applied normally to the surface of said work.

4. In a machine of the class described, having rotatably mounted thereon a drum provided with a resilient work-holding diaphragm, a pattern, means for rotating said work-holding diaphragm and said pattern in corelation with each other, a pivotally mounted tracer arm having one extremity in peripheral contact with said pattern and having its other extremity provided with a cutting mechanism, and a cutter capable of engaging and cutting the work held on and rotated with said diaphragm; means for varying the cutting size of the said work as compared with said pattern, said means including a mechanism for horizontally adjusting the position of the said drum relative to the said pattern on a center line passing through the centers of both; and the further means of pattern driving and drum driving gears journaled on studs, compensating levers pivotally mounted on said studs, a link connecting said levers and having rotatably mounted thereon pinions forming a gear train engaging each other and each of said gears, means for holding said pattern gear and said work-driving gear rotatively synchronized with each other.

5. In a machine of the class described, a base, a rotatable pattern mounted on said base, a drum also revolvably mounted on said base, a resilient work-holding member on said drum, said work-holding member adapted to hold the work by a partial vacuum created under said work by manually pressing said work on said resilient member; a pantograph arm pivotally mounted on said base, one end of said arm being adapted to contact the periphery of said pattern and having on its opposite end a cutter arm holder, a cutter-arm hingedly and retractably mounted thereon, a swivel-mounted cutter adapted to engage and cut the work by pressure applied manually to the surface of the said work; means for varying the relative size of the cut work as compared with the size of the pattern, said means consisting of mechanism for varying the distance between the centers of the pattern and the work-holding drum, both being driven in opposite directions by a train of gears and compensating levers.

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